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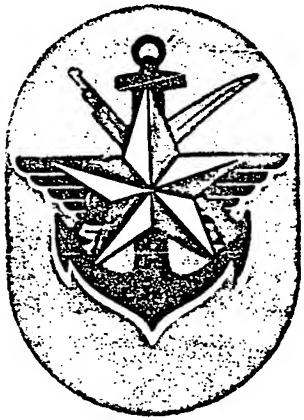
COMBAT DEVELOPMENT & TEST CENTER

VIET NAM



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CONFIDENTIAL

FINAL LETTER REPORT OF EVALUATION OF SQUALENE, MARKING TRACKING AND IDENTIFICATION (JRATA PROJECT 2J-404.0)

CONFIDENTIAL

[redacted]

ADVANCED RESEARCH PROJECTS AGENCY
RESEARCH AND DEVELOPMENT FIELD UNIT
APO San Francisco 96309

RDFU-V
JCR:Ln

JAN 1 1966

SUBJECT: Letter Report - Squalene, Marking, Tracking and Identification

TO: See Distribution List

1. (K) References:

a. ARPA Order #267-62, dated 7 July 1961.

b. US Army Natick Laboratories report, subject: A Study of the Detection of Chemically Contaminated Persons by Dogs, dated April 1964.

c. ARPA/AGILE memorandum V-187/64, subject: Marking, Tracking and Identification, dated 26 August 1964.

d. JRATA memorandum serial 4250, same subject, dated 18 September 1964.

e. RDFU-V memorandum serial 650, same subject, dated 4 November 1964.

f. ARPA/AGILE memorandum, same subject, dated 3 December 1964.

g. COMUSMACV message 17132, same subject, DTG 110830Z December 1964.

h. CINCPAC message, same subject, DTG 180200Z December 1964.

i. RDFU-V paper, subject: Scenario for Field Experiment on Marking/Tracking Identification with Squalene (K), dated May 1965.

j. RDFU-V memorandum serial 897, subject: Squalene, MTI (2J-404.0), dated 27 September 1965.

k. RDFU-V memorandum serial 945, subject: Squalene, MTI (2J-404.0) Field Experiment, dated 12 October 1965.

l. RDFU-V memorandum serial 938, subject: Squalene, MTI (2J-404.0), dated 5 October 1965.

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GROUP-4
Downgraded at 3 year intervals;
Declassified after 12 years
DOD Dir 5200.10

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JUN 2 1966

JRATA 1st Ind

SUBJECT: Final Letter Report of Evaluation of Squalene, Marking, Tracking and Identification (JRATA Project 2J-404.0)

HEADQUARTERS, UNITED STATES MILITARY ASSISTANCE COMMAND, VIETNAM, APO San Francisco 96309

TO: See Distribution Annex to Inclosed Report

Subject document is forwarded for information and retention.

FOR THE COMMANDER:

Alvin E. Cowan

ALVIN E. COWAN
Brigadier General, USA
Director, JRATA

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c. In July 1961, ARPA requested that Natick Laboratories, then Army Quartermaster Laboratory, investigate the possibility of developing a chemical whose scent could be detected by dogs but not by humans (reference 1.a.). The chemical was to be persistent in a hot-wet climate, detectable on humans for two days after contamination, leave a sufficient spoor to enable tracking by dogs, and be suitable for spraying from aircraft and ground units.

d. Natick Laboratories tested several chemicals and found that squalene, a chemical from shark and fish liver oils, seemed to meet the ARPA requirements. A training program and field test were conducted in CONUS using five German Shepherd dogs, two of which proved satisfactory. The results were published in a Natick report in April 1964 (reference 1.b.). The Natick report emphasized that the dogs were trained only to identify marked personnel from among a group of marked and unmarked personnel. The dogs were not trained to track, and had received only limited training in detecting and identifying marked objects. A summary of the original training program is attached as Inclosure 1.

e. On 26 August 1964 ARPA proposed to CINCPAC that a field demonstration be conducted in the Republic of Vietnam (reference 1.c.). JRATA assigned responsibility to RDFU-V on 18 September 1964 (reference 1.d.). On 4 November 1964 RDFU-V suggested to ARPA that a field experiment be conducted in lieu of a demonstration (reference 1.e.). ARPA concurred (reference 1.f.). COMUSMACV gave confirmation on 11 December 1964 (reference 1.g.). CINCPAC approved the task on 18 December 1964 (reference 1.h.).

f. The experiment was planned to begin 1 October 1965 to take advantage of the wet-transition-dry climate from 1 October 1965 to 15 January 1966 (reference 1.i.). Two dogs and a handler arrived 2 August 1965 and other TDY personnel began arriving on 28 August 1965. The dogs were found to be in poor physical condition and state of training. A program of physical conditioning was begun in early August 1965. A training program was begun on 3 September 1965 when squalane became available.

g. The detailed plan for testing the dogs' capabilities was submitted on 27 September 1965 (reference 1.j.). The experiment began on 6 October 1965, and preliminary results showed an extremely poor performance by the dogs (reference 1.k.). A retraining program was begun on 11 October 1965. The detailed plan for testing persistence was submitted on 15 October 1965 (reference 1.l.). Testing of the dogs' capabilities was resumed on 20 October 1965 and concluded on 12 November 1965 (reference 1.m.). Persistence tests began on 15 November 1965 and were concluded on 15 December 1965.

[redacted]

m. RDFU-V memorandum serial 1054, same subject, dated 17 November 1965.

2. (U) Authority:

CINCPAC Message, subject: Marking, Tracking and Identification, DTG 180200Z December 1964.

3. (K) Purpose:

The purposes of this project were:

a. The determination of the effectiveness of dog/squalene techniques for the marking, tracking and identification of personnel.

b. The determination of the persistence of squalene on selected terrain, vegetation and personnel.

4. (K) Background:

a. Definitions:

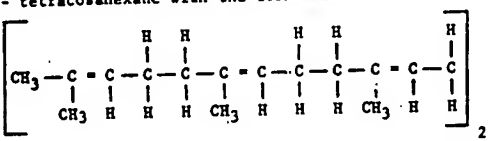
(1) Response or alert - the characteristic reaction of a dog to a squalene or man/squalene scent.

(2) Marked - the intentional contamination of a person or object with squalene.

b. Description of material:

(1) The only material evaluated was squalene, a colorless oil with a slight odor when concentrated. It is found in large quantities in shark and other fish liver oils, and occurs in smaller amounts (0.1 - 0.7%) in olive oil and several other plant seeds and leaves. Human sebum contains approximately 10% squalene. It is also found in the lipides of the epidermal cells.

(2) Chemically squalene is 2, 6, 10, 15, 19, 23 - hexamethyl 2, 6, 14, 18, 22 - tetracosahexane with the formula:



It is soluble in many fat solvents such as ether and oxidizes readily. Squalene has the following physical properties: melting point, -75°C; boiling point, 285°C; flash point, approximately 200°C; viscosity, 12 centiposes at 25°C; specific gravity, 0.8538 at 25°C.

[redacted]

5. (K) Discussion:

a. Phase I - Dogs' Capabilities

(1) Tracking

(a) On 7 October 1965, each dog was tested separately for their ability to track a man whose boots were marked with 40 drops, approximately 2 cc, of 1:4 squalene (1 part of 98% water emulsifiable squalene to 4 parts water). Each man proceeded down a path for 50 to 75 meters then left it. Each then traversed a distance of 150 to 200 meters off-path. After a twenty minute wait, the dog was led to the starting point and a general direction indicated to the handler.

(b) In each case the dog started along the path in the general direction the marked man had taken. Benjie continued as if tracking past the point where the man had left the path. After over 100 meters on the wrong trail, she became confused and began to go in circles as if trying to pick up the scent. She could not. When Buddha reached the point where his man had left the path, he began going back and forth along the path as if trying to pick up the scent. Each dog appeared to try but neither gave any indication of being able to track a fresh man/squalene spoor.

(2) Identification and Detection of Objects

(a) On 8 October 1965 the dogs were tested for their ability to identify and detect objects. Weapons, ammunication, personal equipment, and clothing were arranged in groups five meters apart. The dogs were exposed first to the unmarked objects, then to the same objects marked. The marked objects were then concealed and the dogs attempted to locate them.

(b) Neither dog showed any response to either the marked or unmarked bundles lying in the open. When the objects were concealed, one dog, Benjie, gave a fairly strong alert on one of the objects. Perhaps coincidentally, the object was an extremely sweaty fatigue jacket well impregnated with the man scent. Other than this one exception, the dogs indicated no ability to identify or detect marked objects.

(3) Identification of Marked Personnel

(a) Personnel were lined up at intervals of about five meters. The dogs were led down the line downwind two to four meters from the personnel. Normally no individuals were marked the first time a dog checked the lineup. Subsequently each person marked was marked with approximately 0.2 cc of 1:4 squalene, or four drops, on a gun patch affixed to the breast pocket or the lower trouser leg. Unmarked personnel also wore a patch. The marked individuals were marked at random.

(b) When a dog alerted on an individual, the handler indicated the alert, and the person precipitating the alert was removed from the lineup. The dog was sometimes permitted a chase as a reward. A typical lineup is shown in Figure 1. The typical response of the dog Buddha is shown in Figure 2 and that of Benjie in Figure 3.

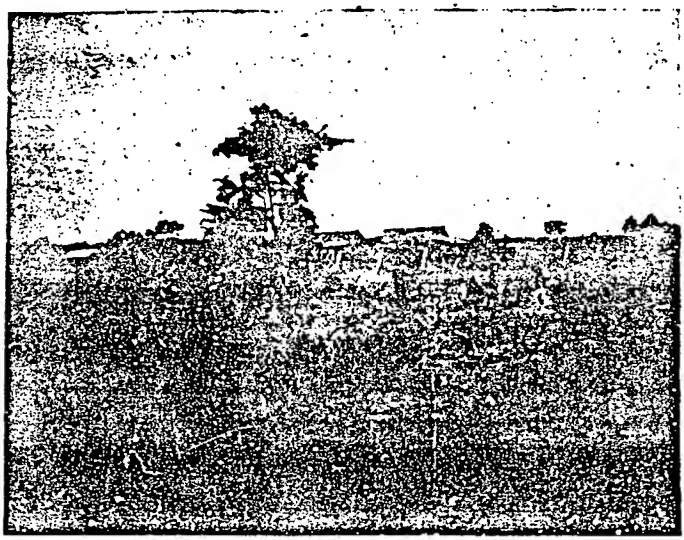


Figure 1. Typical Lineup Identification Procedure

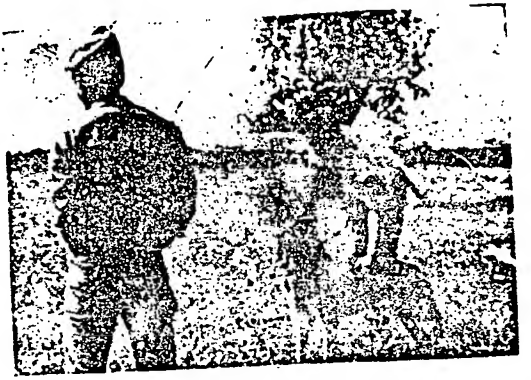


Figure 2. Typical Reaction of Buddha. The dog would hold this position and could not easily be pulled away by the handler. Upon removal of the marked individual, or any movement by him, the dog would then become extremely vicious.

Figure 3. Typical reaction of Benjie. The dog would not hold an alert like Buduha, but would continually try to get at the marked person.

(c) During training, the handlers knew which persons in the lineup were marked; during testing they did not. Actual testing was conducted on only five days during Phase I. From 20 October 1965 to 12 November 1965, training was conducted under actual test conditions; i.e., the handlers did not know who was marked. These "training" days are also included.

(d) On 6 and 7 October 1965 the dogs were tested against both male and female subjects, marked and unmarked. Comparative results are summarized in Table 1. The reactions of the dogs to female

Table 1

Percent of Alerts Against Male and Fale and Female Test Subjects

	Male	Female
Marked	68.4	18.8
Unmarked	29.4	10.0

subjects were significantly different from their reactions to male subjects. The dogs alerted on about one of every five marked female subjects and on about two of every three marked male subjects. They alerted falsely on one of every ten unmarked female subjects and on about one of every three unmarked male subjects. Because of the relative inability of the dogs to alert on female subjects, the remaining tests were confined to male subjects.

(e) The dogs were severely handicapped by their poor physical condition and their lack of appreciable training with squalene for over 18 months. Both dogs were affected by the adverse temperature and humidity conditions. They were easily distracted by any noise or movement, either of which almost invariably caused the testing to be interrupted. A summary of a recommended training program which would probably correct the above deficiencies is attached as Inclosure 2.

(f) Subsequent to 8 October 1965 the dogs underwent an intensive retraining program. Testing and training under test conditions was resumed on 20 October 1965. The dogs' performance improved significantly. From 20 October through 12 November 1965, the dogs correctly identified 109 of 166 marked individuals for a success rate 65.7%. They falsely identified only 17 of 929 unmarked persons for a false alert rate of only 1.8%. Of the 126 persons identified by the dogs, 87.3% had been marked. The dogs' total performance is summarized in Table 2.

Table 2

Dogs' Performance During Phase I

	Buddha		Benjie		Both Dogs	
Date	No. positive identifications /no. marked	No. false identifications /no. unmarked	No. positive identifications /no. marked	No. false identifications /no. unmarked	No. positive identifications /no. marked	No. false identifications /no. unmarked
6 Oct[a]	4/12	9/41	10/12	8/41	14/24	17/82
7 Oct[a]	2/7	14/47	2/7	13/47	4/14	26/94
20 Oct	7/10	0/38	8/10	1/38	15/20	1/76
21 Oct	8/10	2/43	5/5	0/24	13/15	2/67
[illegible] Oct	5/5	0/19	4/5	1/19	9/10	1/38
26 Oct	3/5	1/23	5/5	0/23	8/10	1/46
27 Oct	2/12	1/39	7/10	0/36	9/22	1/75
28 Oct	3/16	0/48	6/16	0/48	9/32	0/96
5 Nov	6/6	2/53	6/6	3/53	12/12	5/106
6 Nov	4/4	2/40	4/4	0/30	8/8	2/70
8 Nov	4/6	0/32	6/6	0/32	10/12	0/64
9 Nov	5/6	2/67	0/6	2/67	5/12	4/134
10 Nov	2/2	0/26	3/5	0/37	5/7	0/63
12 Nov	3/3	0/47	3/3	0/47	6/6	0/94
Totals[b]	52/85(61.2%)	10/475(2.1%)	57/81(70.5%)	7/454(1.5%)	109/166(65.7%)	17/929(1.8%)

a - Not included in totals

b - Do not include 6 - 7 October

[redacted]

At the given concentration, squalene was found to persist on Test Plot 1 for up to 48 hours. The persistence on the individual was not determined. It was suspected that the lack of vegetation afforded little protection from the sun and that the squalene was only deposited on the individuals' boots. A summary of results from Test Plot 1 and cumulative rainfall is given in Table 3.

Table 3

Results from Test Plot 1
(Sprayed at a rate of 7 pounds per acre on 15 November 1965)

Date	Days after Application	No. of Test Subjects Exposed	No. of Test Subjects Identified	Cumulative Rainfall
15 Nov 65	30 min	9	6	None
16 Nov 65	1	3	1	
17 Nov 65	2	3	2	Trace

NOTE: None of the above test subjects returned until over one week later, at which time none were identified. Subsequent exposure of personnel to this test plot yielded only negative results.

(4) Test Plot 2 was sprayed on 17 November 1965 with a squalene concentration of approximately 14 pounds per acre. This plot consisted of grass, shrubs, and bushes two to five feet high and is shown in Figure 5. At the given concentration, squalene was found to persist on Test Plot 2 for up to 28 days. On the individuals squalene persisted for up to 26 days. A summary of results from Test Plot 2 is given in Table 4.

[redacted]

b. Phase II - Persistence Tests

(1) Three different test plots were sprayed with specific amounts of squalene using a gas-operated, turbine-driven, man-portable sprayer. Each plot measured 20 x 30 meters and selected personnel traversed the plots along the long axis. Exposed personnel were placed in a lineup at random among unexposed personnel and checked by the dogs. To test the persistence of squalene on the individual, exposed personnel were requested to return whenever possible.

(2) Although the squalene used had a slight odor when concentrated, there was no noticeable odor during or after application. For several hours after the plots were sprayed, the vegetation appeared to have a slightly wet or oily appearance when examined closely. Thereafter no difference in the sprayed areas was observed.

(3) Test Plot 1 was sprayed on 15 November with a squalene concentration of approximately seven pounds per acre. The plot consisted of low grass and shrub 6 to 12 inches high and is shown in Figure 4.

Figure 4. Test Plot 1. Grass and shrub 6 to 12 inches high.

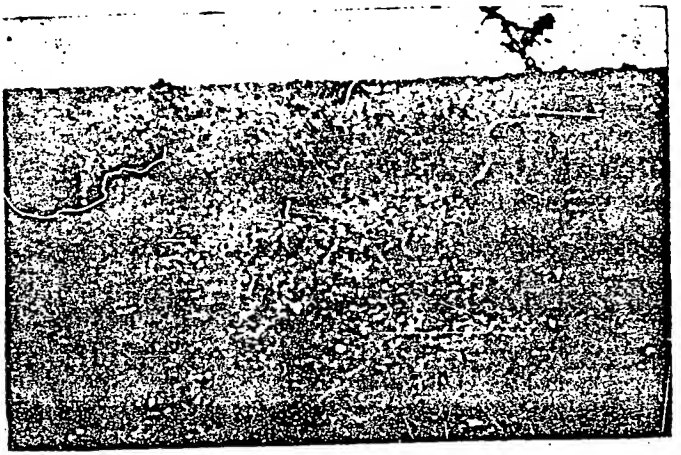


Figure 5. Test Plot 2. Grass shrubs and bushes, 2 to 5 feet high.

Table 4

Results from Test Plot 2
(Sprayed at a rate of 14 pounds per acre on 17 November 1965)

Part A - Persistence on Vegetation

Date	Days after Application	No. of Test Subjects Exposed	No. of Test Subjects Identified	Cumulative Rainfall (Inches)
18 Nov 65	1	3	3	None
19 Nov 65	2	3	3	
20 Nov 65	3	4	4	
23 Nov 65	6	3	2	0.45
27 Nov 65	10	2	2	1.02
29 Nov 65	12	2	2	1.47
2 Dec 65	15	2	2	
4 Dec 65	17	2	2	3.29
8 Dec 65	21	2	2	3.86
9 Dec 65	22	2	2	
10 Dec 65	23	2	2	
11 Dec 65	24	2	2	
14 Dec 65	27	3	3	5.00
15 Dec 65	28	2	2	5.45

Table 4 (cont'd)

Part B - Persistence on Individuals

Test Plot Age (days) at exposure	No. of Test Subjects Exposed	Returned (No. of days after exposure)	No. of Test Subjects Returning	No. of Test Subjects Identified
1	2	1	1	1
2	3	1	2	2
		7	1	0
		10	1	1
		13	1	1
		14	1	1
		15	1	1
		17	1	1
		18	1	1
		19	1	1
		20	1	1
		26	1	1
6	3	3	2	0
		10	1	0
10	2	2	2	1
		5	1	1
		6	1	1
		7	1	1
		9	1	1
		10	1	1
		11	1	1
		12	1	1
12	2	7	1	0
		8	1	0
		10	1	0
		11	1	1
		12	1	0
		14	1	1
		15	1	0
		16	2	2

Table 4 (cont'd)

Part B - Persistence on Individuals (cont'd)

Test Plot Age (days) at Exposure	No. of Test Subjects Exposed	Returned (No. of days after exposure)	No. of Test Subjects Returning	No. of Test Subjects Identified
17	2	2	1	0
		3	2	0
		4	1	0
		5	2	0
		7	1	0
		9	1	1
		11	1	1
21	2	2	2	2
		5	1	1
		6	1	1
		7	1	0
22	2	1	1	1
		6	1	1
24	2	3	2	0

(5) Test Plot 3 was sprayed on 22 November 1965 with a squalene concentration of approximately 14 pounds per acre. This plot was almost identical to Test Plot 2 and is shown in Figure 6. At the given concentration, squalene was found to persist similarly on Test Plot 3 and the individuals tested as with Test Plot 2. Although examination of Test Plot 3 was not completed, squalene was found to persist on the vegetation for at least 21 days and on the individuals for 22 days. A summary of results from Test Plot 3 is given in Table 5.

Figure 6. Test Plot 3. Note similarity to Test Plot 2

Table 5

Results from Test Plot 3
(Sprayed at a rate of 14 pounds per acre on 22 November 1965)

Part A - Persistence on Vegetation

Date	Days after Application	No. of Test Subjects Exposed	No. of Test Subjects Identified	Cumulative Rainfall (Inches)
22 Nov 65	30 min	9	6	None
23 Nov 65	1	3	3	0.45
24 Nov 65	2	2	2	
26 Nov 65	4	2	2	1.02
6 Dec 65	14	2	2	3.86
7 Dec 65	15	2	2	
13 Dec 65	21	1	1	5.00

Part B - Persistence on Individuals

Test Plot Age (days) at Exposure	No. of Test Subjects Exposed	Returned (No. of days after Exposure)	No. of Test Subjects Returning	No. of Test Subjects Identified
30 min	9	1	2	0
		2	2	1
		4	1	1
		5	3	0
		7	3	2
		10	1	0
		11	2	2
		12	2	2
		14	1	1
		15	3	3
		16	2	2
		17	1	0
		18	1	1
		22	1	1

Table 5 (cont'd)

Part B - Persistence on Individuals (cont'd)

Test Plot Age (days) at Exposure	No. of Test Subjects Exposed	Returned (No. of days) after Exposure	No. of Test Subjects Returning	No. of Test Subjects Identified
1	3	1	3	1
		3	2	1
		6	2	0
		11	1	1
		14	1	1
		16	1	1
		20	1	1
		22	1	1
2	2	3	2	1
		5	1	0
		9	1	0
		10	1	0
		12	1	0
		13	1	1
		14	1	1
		19	1	1
		21	1	1
4	2	1	1	1
		6	1	0
		7	1	0
		10	1	1
14	2	2	1	0
		4	1	1
15	2	2	1	1
		4	1	1
		6	1	1
		8	1	1

6. (K) Findings:

a. Neither dog gave indications of being able to track a fresh man/squalene spoor.

b. The dogs could not identify or detect marked objects.

c. The dogs were unable to alert reliably on female test subjects.

d. Both dogs were sucessful in identifying marked male Vietnamese placed randomly among unmarked male Vietnamese.

e. When sprayed at a concentration of 14 pounds per acre, squalene persisted for up to 28 days on one of the test plots.

f. Squalene persisted for up to 26 days on individuals who had traversed one of the test plots.

7. (K) Conclusions:

a. German Shepherd dogs can be trained and employed successfully in SVN to identify male Vietnamese personnel marked with squalene.

b. Squalene will persist on vegetation sufficiently to contaminate (mark) personnel for a period of 28 days in the last quarter of the calendar year.

c. Squalene will persist on male Vietnamese personnel, sufficiently to permit an alert by trained dogs, for a period of 26 days.

8. (K) Recommendation:

That the United States Military Assistance Command, Vietnam, consider a dog/squalene system for employment in Vietnam.

KEMPER W. BAKER
Colonel USAF
Director

3 Incl:
1. Summary of the Original Training Program in CONUS
2. Summary of the Recommended Training Program
3. Distribution List

[redacted]

SUMMARY OF THE ORIGINAL TRAINING PROGRAM IN CONUS

This summary describes the training program conducted at Fort Benning, Georgia, beginning March 1963. The program consisted of one week of basic obedience training, one week of scout training using both personnel and objects marked with squalene, one week of scout training using only part of the personnel and objects marked, and 18 weeks of lineup identification and scout training with marked and unmarked male personnel.

Although the five dogs selected for the program had had some basic obedience, some difficulty was experienced during the first week with dog/handler compatibility. The handlers finally selected had no further difficulties.

At the beginning of the scout training, three decoys, one marked, were placed in the training field. The dogs reacted the same to all three and after correction still did not respond correctly. Thereafter only marked personnel and objects were used as decoys during the initial training, until the dogs began to respond strongly.

The following week both marked and unmarked personnel were used. When a dog responded to an unmarked person, he was corrected. If he responded correctly, he was given a reward by being allowed to chase the marked individual. Only one dog did not respond to the training. He would not respond to any training, was judged to have subpar intelligence, and subsequently dropped from the program.

Two of the other dogs also were a problem. One dog was extremely gun shy and easily distracted even by distant firing. Efforts to cure him failed and he was also eventually dropped from the program. The best trained dog of the five was afflicted with hip dysplasia. His condition worsened with time and he was euthanized near the end of the program.

To intensify the dogs' response to the man/squalene odor, a decoy agitated the dog with a squalene-soaked rag. Next a decoy in a padded suit agitated the dogs and they were permitted to bite him. One dog (Benjie) did not respond to this training but continued to do well in the other portions of the program.

The next phase of training was lineup identification. Initially the dogs were not as interested in this training as they had been in the scout training using hidden decoys. It took about three days to get the dogs to respond correctly. Scout training was continued concurrently.

ENCLOSURE (1)

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The next phase should consist of seven weeks of lineup identification (Step 4). Marked personnel should be mixed at random with unmarked personnel in lineups. At this point the amount of squalene should be gradually decreased from a fairly large amount (5 to 10 milligrams) to a small amount (app. 2 micrograms or less). When the dogs show signs of giving a weak alert at a certain level, the amount should be increased to the previous level for a few days and then again decreased.

During the same period some scout training should be continued. In addition, the dogs should be introduced to a procedure of checking people as they pass through a checkpoint or while in a crowd such as would be found in a market place. Routine should be avoided in the early stages of training so that the dog will not alert on certain movements or commands, but only on the man/squalene scent. At the end of the first 13 weeks of training, the handler should be familiar enough with his dog to interpret a true alert without exception.

The final three weeks training (Step 5) should be conducted in the foreign country in which the dogs are to be employed. The group of dogs, handlers, and the instructor should be a package unit, at least until the dogs are employed, for maximum efficiency and continuity. In the country of employment, indigenous personnel should be used as test subjects and a competent interpreter assigned to the group. The final three weeks should consist of refresher training, acclimization, and maintenance of top physical condition for both dogs and handlers.

[redacted]

[redacted]

SUMMARY OF RECOMMENDED TRAINING PROGRAM

This inclosure summarizes a recommended training program to be used in preparing dogs to be employed using man/squalene techniques. The program consists of five steps over a 16 week period. The five steps include:

1. Two weeks of basic obedience training.

2. One week of scout training using marked personnel only. Female as well as male personnel should be included as test subjects throughout the training program.

3. Three weeks of scout training with only part of the personnel marked.

4. Seven weeks of scout, lineup, checkpoint and crowd training using both marked personnel.

5. Three weeks of refresher training in the country in which the dogs are to be employed.

The initial two weeks of obedience training (Step 1) should be conducted in accordance with FM 20-20. During the first week of scout training (Step 2), only marked personnel should be used. The marked decoy should be concealed 25 to 30 meters upwind from the dog. The dog should be worked in toward the decoy until he shows signs of alerting, at which time he is led toward the decoy. When the dog is 4 to 5 meters away, the decoy should get up and run with the dog giving chase as a reward.

After the dogs begin to react strongly to such exercises, the response should be reinforced by agitation with a rolled up sack soaked with squalene, and then by a marked agitator in a padded suit. The man should be placed in the center of a circle and the dogs allowed to bite his sleeve. In this manner the stronger responding dogs will reinforce the weaker responding ones. It is important that the duty of decoy be rotated to prevent the dogs from responding to particular individuals rather than to the man/squalene odor.

During the next three weeks of scout training (Step 3), both marked and unmarked personnel should be used. At first the dogs might show a tendency to alert on both marked and unmarked personnel, but should be vigorously corrected when they alert on unmarked personnel and rewarded when they alert correctly. Again, the marked persons should not always be the same. At this point the dogs should begin to work under distracting influences. The presence of people, noise, movement, animals, etc., should not be eliminated, but instead every effort should be made to create such distractions if they do not exist.

[redacted]

[redacted]

At first the handlers knew who was marked so that they could help the dog, but after the first few weeks they no longer knew. Corrections were still made if the dog made a mistake. To prevent the dogs from becoming accustomed to always finding a marked person, they were sometimes exposed to lineups with no one marked.

About mid-way through the program, the training with marked objects was discontinued and the dogs concentrated on the identification of marked personnel. During the latter portion of the program, the amount of squalene used for marking was reduced at a programmed rate. The dogs responded well until the inoculum was reduced to 4 drops of 3 percent squalene. When they responded slower, the dose was increased to the previous level for a few more days, then again reduced. Using this method, the dogs could, at the end of 21 weeks of training, respond with 100% accuracy to 4 drops of 0.001 percent squalene, or approximately 2×10^{-6}cc.

The Natick tests, in which the dogs were 100% accurate, were conducted from August to December 1963 using two dogs, Buddha and Benjie. The two dogs were kept at Fort Benning from December 1963 to August 1965, when they were sent to Vietnam.

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13 ABSTRACT

Field experiments were conducted in order to determine the effectiveness of dog/squalene techniques for the marking, tracking, and identification of personnel and to measure the persistance of squalene on selected terrain, vegetation, and personnel. (K)

The two dogs used in the tests could not: (a) track a fresh man/squalene spoor; (b) identify or detect squalene marked objects; and (c) reliably identify squalene marked females. However, the dogs were successful in identifying squalene marked Vietnamese males placed randomly among unmarked male Vietnamese. Squalene, sprayed at a concentration of 14 pounds per acre, was found to persist on tested vegetation for up to 28 days and to persist on personnel who had traversed a test plot for up to 26 days. (K)

The report recommends that MACV consider a dog/squalene system for employment in Vietnam and includes a recommended training program to be used in preparing dogs to be employed using man/squalene techniques (K).

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